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FEE TRANSMITTAL
For FY 2005

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT	($) 500.00

Complete if Known	
Application Number	10/695,200
Filing Date	October 28, 2003
First Named Inventor	Mark E. Zachman
Examiner Name	Raymond W. Addie
Art Unit	3671
Attorney Docket No.	SPC 0378 IA/40719.773

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FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

	FILING FEES		SEARCH FEES		EXAMINATION FEES		
Application Type	Fee ($)	Small Entity Fee ($)	Fee ($)	Small Entity Fee ($)	Fee ($)	Small Entity Fee ($)	Fees Paid ($)
Utility	300	150	500	250	200	100	
Design	200	100	100	50	130	65	
Plant	200	100	300	150	160	80	
Reissue	300	150	500	250	600	300	
Provisional	200	100	0	0	0	0	

2. EXCESS CLAIM FEES

Fee Description	Fee ($)	Small Entity Fee ($)
Each claim over 20 or, for Reissues, each claim over 20 and more than in the original patent	50	25
Each independent claim over 3 or, for Reissues, each independent claim more than in the original patent	200	100
Multiple dependent claims	360	180

Total Claims ______ - 20 or HP = **Extra Claims** ______ x **Fee ($)** ______ = **Fee Paid ($)** ______

HP = highest number of total claims paid for, if greater than 20

Indep. Claims ______ - 3 or HP = **Extra Claims** ______ x **Fee ($)** ______ = **Fee Paid ($)** ______

HP = highest number of independent claims paid for, if greater than 3

Multiple Dependent Claims **Fee ($)** ______ **Fee Paid ($)** ______

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

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Non-English Specification, $130 fee (no small entity discount) ______

Other: Appeal Brief 500.00

SUBMITTED BY			
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of

Applicants	: Zachman et al.
Serial No.	: 10/695,200
Confirm. No.	: 4518
Filed	: October 28, 2003
Title	: **TRANSDUCER ARRANGEMENT**
Docket	: SPC 0378 IA/40719.773
Examiner	: Addie, Raymond W.
Art Unit	: 3671

CERTIFICATE OF MAILING
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APPEAL BRIEF

The present Appeal Brief is submitted in support of the Notice of Appeal filed by Certificate of Facsimile Transmission on July 25, 2005, having a filing date of on or before September 26, 2005 (weekend exception rule).

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is the assignee of the present application, Trimble Navigation Limited.

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to the Appellants, the Appellants' undersigned legal representative or the assignee which will directly effect or be directly effected by or having a bearing on the Board's decision in the present appeal.

III. STATUS OF THE CLAIMS

Claims 1-17 are pending in this application as originally filed. Claims 1-17 stand rejected and are the subject of the present appeal. A copy of the appealed claims is set forth in the Appendix.

IV. STATUS OF AMENDMENT FILED SUBSEQUENT TO REJECTION ON APPEAL

No amendments have been filed in this matter.

V. SUMMARY OF THE INVENTION

The present invention is generally directed to a system and method for controlling movement of individual hydraulically moveable ends of an elongated tool to maintain a selected elevational position between each end of the tool and a reference (independent claims 9 and 13). In one specific embodiment, the present invention is directed to a method for controlling movement of individual hydraulically moveable ends of a screed head carried by a machine so as to maintain a selected elevational position between each end of the screed head and an elevational reference in a concrete paving application (independent claim 1). In another specific embodiment, the present invention is a control system for controlling movement of individual

hydraulically moveable ends of a screed head carried by a boom of a machine so as to maintain a selected elevational position between each end of the screed head and a reference in a concrete paving application as the screed head is moved toward the machine (independent claim 3).

According to independent claim 1, the method comprises providing a control system controlling the hydraulically moveable ends of the screed head, providing a pair of laser receivers and a gravity-based cross slope sensor to the screed head and in communication with the control system. The pair of laser receivers is set in an appropriate dead band with the elevational reference. When one of the laser receivers loses reception of the elevational reference, the gravity-based cross slope sensor is used to provide a relative measurement of the interrupted laser receiver which, when coupled with an absolute measurement of the uninterrupted laser receiver, provides an estimate of the absolute position of the interrupted laser receive. The control system uses the provided absolute and estimated absolute positions to control the elevation of the hydraulically moveable ends of the screed head.

Claim 2 depends from claim 1. According to claim 2, the method further comprises measuring a desired grade with the gravity-based cross slope sensor, and storing the desired grade in memory of the control system.

According to independent claim 3, the control system comprises an elevation receiver, mounted on a first end of the screed head, which provides a first signal indicating the position of the first end of the screed head in relation to the reference. An elevation receiver, mounted on a second end of the screed head, provides a second signal indicating the position of the second end of the screed head in relation to the reference. A sensor, mounted on the screed head for sensing slope of the screed head along its length from the first end to the second end, provides a third signal indicating the slope. A control circuit, responsive to the elevation receivers and to the

sensor, controls the hydraulically moveable ends of the screed head using the first and second signals from the elevation receivers when the first and second signals are available. The control circuit for controlling the hydraulically movable ends of the screed head uses the third signal from the sensor and one of the first and second signals from the elevation receivers when the other of the first and second signals is not available.

Claims 4-8 depend directly or indirectly from claim 3. Claim 4 recites that the control circuit maintains the screed head in an orientation such that the third signal remains substantially constant when one of the first and second signals from the elevation receivers is not available, whereby the orientation of the screed head along its length from the first end to the second end also is maintained substantially constant. Claim 5 recites that the sensor is an inclinometer mounted on the screed head. Claim 6 depends from claim 5 and recites that the inclinometer is a pendulum sensor with a low pass filtered output. Claim 7 recites that the receivers are light detectors, and in which the reference is established by a beam of light. Claim 8 recites that the receivers are laser light detectors and in which the reference is established by a beam of laser light.

According to independent claim 9, the control system comprises an elevation receiver, mounted on a first end of the tool, which provides a first signal indicating the position of the first end of the tool in relation to the reference. An elevation receiver, mounted on a second end of the tool, provides a second signal indicating the position of the second end of the tool in relation to the reference. A sensor, mounted on the tool, for sensing slope of the tool along its length from the first end to the second end, provides a third signal indicating the slope. A control circuit, responsive to the elevation receivers and to the sensor, controls the hydraulically moveable ends of the tool using the first and second signals from the elevation receivers when

the first and second signals are available. The control circuit for controlling the hydraulically movable ends of the tool uses the third signal from the sensor and one of the first and second signals from the elevation receivers when the other of the first and second signals is not available.

Claims 10-12 depend from claim 9. Claim 10 recites that the sensor is an inclinometer mounted on the tool. Claim 11 recites that the control circuit maintains the tool in an orientation such that the third signal remains substantially constant when one of the first and second signals from the elevation receivers is not available, whereby the slope of the tool along its length from the first end to the second end also is maintained substantially constant. Claim 12 recites that the sensor is a pendulum sensor with a low pass filtered output.

According to claim 13, the method comprises selecting a desired elevational position of the tool with respect to the reference, and sensing with the elevation receivers the position of the ends of the tool in relation to the reference. Slope of the tool along its length from one end to the other is also sensed. The elevational positions of the ends of the tool are controlled using the sensed positions of the ends of the tool in relation to the reference when such positions are both known. When reception of at least one of the elevation receivers of the reference is interrupted, the elevational positions of the ends of the tool are controlled using the sensed position of one of the ends of the tool and the sensed orientation of the tool along its length from one end to the other when such positions are not both known.

Claims 14-17 depend from claim 13. Claim 14 recites that the method further comprises detecting lateral movement of the tool generally in the direction of the length of the tool, and discontinuing controlling the elevational positions of the ends of the tool using the sensed orientation of the tool until the lateral movement of the tool generally in the direction of the

length of the tool is terminated. Claim 15 recites that sensing slope of the tool along its length includes using an inclinometer. Claim 16 recites that the elevation receivers are light detectors and the reference is a rotating beam of light. Claim 17 recites that the elevation receivers are laser light detectors and the reference is a rotating beam of laser light.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The issues on appeal are the rejections of claims 1-17 under 35 U.S.C. §103(a). Claims 1 and 2 are rejected under 35 USC 103(a) as being unpatentable over Hohmann, Jr. (US 5,556,226) in view of Clegg (US 4,807,131) and Burgin (US 3,816,937). Claims 3-5, 7-11 and 13-37 are rejected as being unpatentable over Hohmann, Jr. in view of Clegg. Claims 6 and 12 are rejected as being unpatentable over Hohmann, Jr. in view of Clegg and Heiser et al (US 4,925,340).

Claims 1-6, 9-11, and 13-15 are argued independently, and claims 7, 8, 12, 16 and 17 stand or fall with their independent claims.

VII. ARGUMENTS

A. The Examiner's Position

The Examiner rejected claims 1 and 2 under 35 U.S.C. 103(a) as being unpatentable over Hohmann, Jr. # 5,556,226 in view of Clegg #4,807,131 and Burgin # 3,816,937. The Examiner states that Hohmann, Jr. discloses an automated laser aligned leveling screed and method of use comprising:

Controlling movement of individual, hydraulically moveable ends (17, 2nd end not

numbered) of a screed head (15) so as to maintain a substantially horizontallylevel, elevational position between each end of the screed head (15) and an elevational reference (59, 61).

Providing a control system (67) controlling the hydraulically moveable, 1st and 2~ ends of the screed head.

Providing a pair of laser receivers (51, 53) to the screed head (15), in communication with the control system (67).

Setting the pair of laser receivers (51, 53) in an appropriate dead band with the elevational reference. See col. 5, lines. 43-54.

Detecting a "column block" situation, wherein at least one laser receiver (51, 53) is obstructed from the elevational reference (59), and maintaining the screed head (15) in a substantially horizontally level orientation. See col. 3, In. 1-col. 5, In. 67.

The Examiner concedes that Hohmann, Jr. does not disclose maintaining the screed head (15) in an orientation approximately parallel with a desired transverse slope, such as is needed in banked curves on roads and drainage sloped in concrete slabs and floors. The Examiner cures the above noted deficiency by pointing to Clegg. Clegg teaches a fully automated earth-working machine and method of controlling the transverse cross-slope of a leveling implement (32) utilizing multiple sensor systems, such as laser receivers and beacons (12, 10) respectively, in combination with either distance or angle measuring instruments, such as gyroscopes or inertial detectors such as cross slope angle detector (35). It is the Examiner's position that Clegg discloses the desirability in combining multiple sensor technologies, in order to take advantage

of each systems unique abilities, such that the "interconnection, interaction and interrelationship of such devices is novel and working together, accomplish results not previously accomplished." The Examiner re-affirms this position by stating in the Advisory Action, that Clegg's disclosure in col. 8 clearly teaches the desirability of combining several different types of sensors into a single control circuit in order to control movement of the implement, specifically taking advantage of each sensors flexibility and technology, to include the use of lasers, ultrasonic and infrared measuring devices. Therefore, the Examiner states that it would have been obvious to one of ordinary skill in the art, at the time the invention was made to provide the method of controlling a leveling device of Hohmann, Jr., with the method of combining cross-slope sensors with laser elevation detectors, in order to maintain a desired, non-horizontal transverse slope of the leveling device, as taught by Clegg, in order to accomplish leveling results not previously accomplished. For support, the Examiner point's to Clegg, col. 7, line 37-col. 9, lines 56; and col. 10, line 49-col. 11, line 26.

The Examiner concedes that Clegg does not disclose what types of cross-slope sensors could be utilized to measure and produce a signal representing the cross-slope of the leveling tool. To cure the noted deficiency, the Examiner points to Burgin. Burgin is cited for teaching that gravity-based cross-slope sensors are advantageously used with a slope control console, which can be secured to a paver such that the sensor can sense the inclination of a leveling tool, such as a screed head (E), relative to a predetermined slope, since the sensor can be directly attached to the screed head (E). Therefore, it is the Examiner's position that it would have been obvious to one of ordinary skill in the art, at the time the invention was made to provide the method of controlling a leveling device, during a column block situation of Hohmann, Jr., with

the method steps of providing and attaching a gravity based cross slope sensor directly to a leveling device, as taught by Clegg and Burgin, in order to maintain the cross slope of the leveling device, with respect to a desired cross-slope, such that the level of accuracy (overall smoothness) of the leveled concrete is greater than that previously achievable. For support, the Examiner points to Burgin col. 2, lines 51-col. 5, line 47.

In regards to claim 2, the Examiner states that Hohmann, Jr. teaches a known problem exists when laser receivers of a concrete leveling device is blocked from receiving a reference beam. However, the Examiner concedes that Hohmann, Jr. does not disclose providing a gravity based cross slope sensor to measure and store a current transverse grade of the leveling device. To cure this noted deficiency, the Examiner points to Clegg for teaching the use of a processing system including a cross slope sensor (35) such that the actual cross slope angle, at which the leveling device is grading a surface, being measured by a cross-slope detector (35) the output of which is encoded in digital form in encoder 35a or to a central processing unit for the system shown at (120), and used for comparison to a desired final grade of the leveling device at any given point on the site. The Examiner also points to Burgin for teaching a cross slope sensor, in the form of a gravity-based cross slope sensor and method of using said gravity based sensor to measure the transverse slope of a paving device. Therefore, it is the Examiner's position that it would have been obvious to one of ordinary skill in the art, at the time the invention was made to provide the method of controlling a leveling device in a column block situation, with the method step of measuring the current cross slope of a leveling device, with a gravity based cross slope sensor as taught by Clegg and Burgin, in order to maximize the smoothness of the leveled concrete.

The Examiner rejected claims 3-5, 7-11, 13-17 under 35 U.S.C. 103(a) as being unpatentable over Hohmann, Jr. #5,556,226 in view of Clegg #4,807,131. The Examiner states that Hohmann, Jr. discloses a control system for controlling movement of individual, hydraulically moveable ends (17, 2nd end not numbered) of a screed head (15) so as to maintain a substantially horizontally-level, elevational position between each end of the screed head (15) and an elevational reference (59, 61) as the screed head is moved toward the machine (1). Said control system comprising:

> 1st and 2nd elevation receivers (51, 53) mounted on respective 1st and 2nd ends and providing signals indicating the position of the 1st and 2nd ends of the screed head (15) in relation to an elevational reference (59, 61).

Hohmann, Jr. discloses a known problem exists when one of the laser receivers is prevented from receiving the reference laser beam (59). However, the Examiner concedes that Hohmann, Jr. does not disclose the uses of a cross slope sensor and a control circuit responsive to laser receivers and cross slope sensors, to maintain the screed head in an other than horizontal orientation. To cure this deficiency the Examiner points to Clegg for teaching a fully automated earth-working machine capable of controlling the transverse cross-slope of a leveling implement (32) utilizing a control circuit (50, 52, 140, 120), which is capable of receiving signals from multiple sensor systems, such as laser receivers and beacons (12, 10) respectively, in combination with either distance or angle measuring instruments, such as gyroscopes or inertial detectors such as cross slope angle detector (35), such that the signal from the cross slope sensor (35) remains substantially constant; whereby the transverse slope also is maintained substantially

constant. It is the Examiner's position that Clegg recites the desirability in combining multiple sensor technologies, to maintain a desired transverse slope of the leveling device, in order to take advantage of each systems unique abilities, such that the "interconnection, interaction and interrelationship of such devices is novel and working together, accomplish results not previously accomplished." Therefore, it is the Examiner's position that would have been obvious to one of ordinary skill in the art, at the time the invention was made to provide the paving machine of Hohmann, Jr. with a cross slope sensor and control system capable of receiving signals from both laser receivers and cross slope sensors, as taught by Clegg, in order to maintain a desired transverse slope of a leveling device, when one of the sensor systems is not functioning properly as reasonably suggested by Clegg. For support, the Examiner points to Clegg, cols. 9-11.

In regards to claims 5, and 10, the Examiner states that Hohmann, Jr. discloses, as put forth with respect to claim 3 above, controlling movement of individual hydraulically moveable ends of a screed head carried by a boom of a machine so is to maintain a horizontal position between each end of the screed head and a reference (59, 61) in a concrete paving application as the screed head is moved toward the machine. However, the Examiner concedes that the reference does not disclose utilizing additional sensor systems and control circuit capable of receiving signals from additional sensors. To cure this noted deficiency the Examiner points to Clegg for reciting the desirability in combining multiple sensor technologies, to maintain a desired transverse slope of the leveling device, in order to take advantage of each systems unique abilities, such that the "interconnection, interaction and interrelationship of such devices is novel and working together, accomplish results not previously accomplished." The Examiner further

adds that this includes the use of relative motion signal generators and inertial detectors, which is seen to include inclinometers. For support, the Examiner points to col. 12, lines 1-20 of Clegg. Therefore, it is the Examiner's position that it would have been obvious to one of ordinary skill in the art, at the time the invention was made to provide the paving machine of Hohmann, Jr. with a cross slope sensor and control system capable of receiving signals from both laser receivers and cross slope sensors, as taught by Clegg, in order to maintain a desired transverse slope of a leveling device, when one of the sensor systems is not functioning properly, as reasonably suggested by Clegg. Again, the Examiner points to Clegg, cols. 9-11 for support.

In regards to claims 7 and 8, Hohmann, Jr. is cited for disclosing the use of laser beacons and laser receivers.

In regards to claims 13, 15, and 16 Hohmann, Jr. is cited for disclosing a method of controlling the elevational position of hydraulically moveable ends of a tool in relation to a reference detected by elevation receivers (51, 53), such as laser receivers attached to longitudinal ends of the screed head (15), the method comprising:

Selecting a desired elevational position of the screed head (15) with respect to a laser reference beam (59).

Controlling the elevational positions of the ends of the tool using the sensed positions of the ends of the tool in relation to the reference laser beam when both are known.

Hohmann, Jr. is again cited for disclosing that a known problem exists when one of the laser receivers does not receive an elevational reference beam (59). The Examiner concedes that Hohmann, Jr. does not disclose the steps of measuring the positions of the ends of the tool in

relation to a reference, and sensing the cross slope of tool. To cure this deficiency, the Examiner points to Clegg. Clegg is cited for teaching a fully automated earth-working machine and method of controlling the transverse cross-slope of a leveling implement (32) utilizing multiple sensor systems, such as laser receivers and beacons (12, 10) respectively, in combination with a cross slope angle detector (35). The Examiner states that method comprising the steps of:

Sensing with the elevational receivers (12) the positions of ~he ends of the tool in relation to a laser reference beam.

Sensing the transverse slope of the tool with a cross slope sensor (35). Controlling the elevational ends of the tool using at least one signal from a laser receiver (12) and the cross slope sensor signal to maintain the tool in a desired transverse slope.

Clegg is also recited for disclosing the desirability in combining multiple sensor technologies, in order to take advantage of each systems unique abilities, such that the "interconnection, interaction and interrelationship of such devices is novel and working together, accomplish results not previously accomplished." Therefore, it is the Examiner's position that it would have been obvious to one of ordinary skill in the art, at the time the invention was made to provide the method of controlling a leveling device of Hohmann, Jr., with the method of combining cross-slope sensors with laser elevation detectors, in order to maintain a desired, non-horizontal transverse slope of the leveling device, as taught by Clegg, in order to accomplish leveling results not previously accomplished. For support, the Examiner points to Clegg, col. 7, line 37-col. 9, line 56; and col. 10, lines 49-col. 11, line 26.

In regards to claim 14, the Examiner states that Hohmann, Jr. discloses a method of controlling laser-guided screed heads, during a column block situation, wherein during retracting of the screed head on the boom, a laser beacon is known to become blocked from a laser receiver on one of the ends of the screed head. Hohmann, Jr. discloses "As the screed is moved around the floor (this is seen to include retraction and lateral motion of the boom)...the vertical support columns frequently block the laser beam...and it disrupts the automatic operation of the laser screed...The operator must immediately assume manual height control of the affected screed end when the column block light is illuminated...until the sensor moves into a position where it is unblocked (which is seen to include retraction and lateral motion of the screed head, as is normal operation of the paving machine." Col. 2, lines 43-62. Hence, it would have been obvious to the method of controlling a laser guided screed head during a column block situation of Hohmann, Jr. to terminate control of the ends of the screed head and assuming manual control of the screed head, to complete retraction of the screed head, past the building column causing the "blocked sensor" until the sensor moves into a position where it is unblocked, includes retraction and lateral motion of the screed head, since both motions are commonly necessary to clear the blocked sensor. For support, the Examiner points to col. 2, line 33-col. 3, line 5.

The Examiner also rejected claims 6 and 12 under 35 U.S.C. 103(a) as being unpatentable over Hohmann, Jr. # 5,556,226 in view of Clegg #4,807,131 in view of Heiser et al. #4,925,340. It is the Examiner's position that Hohmann, Jr. in view of Clegg discloses a control system of maintaining a non-horizontal orientation of a screed head for forming roads and the like having a desired cross section, to include the desirability to of utilizing combinations of sensor technologies such as laser receivers and gravity-type cross-slope sensors. The Examiner

concedes that the combined teachings of Hohmann, Jr. and Clegg do not explicitly recite using a pendulum type cross-slope sensor. To cure this deficiency, the Examiner points to Heiser et al. for teaching that pendulum type cross-slope sensor are commonly used on paving machines, specifically to maintain a desired transverse slope of a leveling device (12) with respect to gravity, and is mounted directly on the leveling device to for maximum accuracy. Therefore, it is the Examiner's position that it would have been obvious to one of ordinary skill in the art, at the time the invention was made to provide the paving machine of Hohmann, Jr. in view of Clegg, with a pendulum type cross slope sensor, as taught by Heiser et al., in order to form inclined concrete surfaces, to exacting specifications. For support, the Examiner points to Heiser et al., Figs. 3, 4; Col. 2, line 30-col. 3, line 44.

Lastly, the Examiner further points to the disclosure by Clegg in col. 8, lines 10-15, "Generally speaking, however, it is desirable to use two or three types of signal generating devices, taking advantage of the particular <u>precision</u> and flexibility of each. Distance from reference points may be determined, for example, using electronic distance measuring devices which rely upon infrared or other radiation reflection." It is therefore the Examiner's belief that Clegg alone provides a *self-supporting* case of obviousness, by providing specific and concise motivation to "use two or three types of signal generating devices, taking advantage of the particular precision and flexibility of each." The Examiner asserts therefore, in light of the disclosure of Clegg, it would be obvious to provide a different technology(ies) capable of maintaining a desired grade of a grading implement while a laser receiving is blocked from receiving a reference laser beacon. See page 17 of the May 24, 2005 Office Action.

B. <u>To establish a *prima facie* case of obviousness.</u>

In order to establish a *prima facie* case of obviousness, the Examiner has the burden of showing, by reasoning or evidence, that: 1) there is some suggestion or motivation, either in the reference itself or in the knowledge available in the art, to modify that reference's teachings; 2) there is a reasonable expectation on the part of the skilled practitioner that the modification or combination has a reasonable expectation of success; and 3) the prior art reference must teach or suggest all of the claim limitations. Both the teaching or suggestion and the reasonable expectation of success must be found in the prior art and not based on an applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991); see also, MPEP 2142-2143.

In carrying this burden, the Examiner "must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious." *Ex parte Clapp*, 227 USPQ 972, 973 (PTOBPAI 1985). The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). A rejection based on §103 clearly must rest on a factual basis, and these facts must be interpreted without hindsight reconstruction of the invention from the prior art. *In re Warner*, 154 USPQ 173, 178 (CCPA 1967). The Examiner may *not*, because he may doubt that the invention is patentable, resort to speculation, unfounded assumptions, or hindsight reconstruction to supply deficiencies in his required factual basis. *Id.*

In addition, a prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. Furthermore, in determining the differences between the prior art and the claims, the question under 35 U.S.C. 103 is not whether the differences themselves would have been obvious, but whether the claimed

invention as a whole would have been obvious. *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983); *Schenck v. Nortron Corp.*, 713 F.2d 782, 218 USPQ 698 (Fed. Cir. 1983).

C. Rejection of claims 1 and 2 based on Hohmann, Jr. in view of Clegg and Burgin fails to a establish *prima facie* case of obviousness and should be withdrawn.

Hohmann, Jr. teaches that "[i]f a switching unit 91 does not detect the adjustment signals from a controller unit 67 or 77 for a specified interval, it determines that the associated detector 51 or 53 is blocked. Under these conditions, the switching control 91 switches the adjustment signals from the controller unit associated with the unblocked detector to the solenoid valve associated with the block detector so that both of the solenoid valves then receive the adjustment signal generated from the unblocked detector." Col. 6, lines 18-26. Therefore, Hohmann, Jr. teaches the use of only one of the elevation detectors to control the position of the ends of the tool during a column block situation.

Clearly, Hohmann, Jr. fails to disclose or suggest either the use of "a pair of laser receivers and a gravity-base cross slope sensor" or "using the gravity-based cross slope sensor when one of the laser receivers loses reception of the elevational reference to provide a relative measurement of the interrupted laser receiver" as recited by independent claim 1. In addition, Hohmann, Jr. does not disclose or suggest measuring a desired grade with the gravity-based cross slope sensor, and storing the desired grade in memory of the control system as recited from claim 2, which depends from claim 1. The fact that Hohmann, Jr. also does not disclose maintaining the screed head in an orientation approximately parallel with a desired transverse

slope as noted by the Examiner, only further proves that the above noted limitations of the claims are missing from the teachings of Hohmann, Jr.

However, to cure the above noted missing limitations in the teaching of Hohmann, Jr., the Examiner then points to Clegg for teaching a fully automated earth-working machine and method of controlling the transverse cross-slope of a leveling implement utilizing multiple sensor system. In particular, the Examiner points to a general statement provided in the art (Clegg in Col. 8, lines 10-15) as the basis for teaching that the slope sensor may be used as an alternative sensor upon losing reception by one of the laser receivers, such as in a column block situation, to maintain the position of the tool. Clearly, such a general statement as applied by the Examiner in formulating this rejection, overreaches by including knowledge gleaned from applicants and fails to take into account only the knowledge which was within the level of one of ordinary skill in the art at the time the claimed invention was made.

When Clegg is read fully, the passage cited by the Examiner for providing the motivation to modify the control system of Hohmann, Jr. as suggested, discloses using two or three types of signal generating devices for the purpose of determining distance, location, elevation and/or heading of the earth mover. See in particular, column 7, line 54-column 8, line 27, which is the paragraph to which the above general statement of desirability is pulled from, and thus in context refers specifically to the earth mover and <u>not</u> the leveling implement.

Using Clegg's general statement out of context to provide the motivation of combining a number of sensing devices to control a leveling implement, and to configure a system to have one sensor take over for a different type of sensor when such a sensor is not producing a control signal, does not satisfy the requirement of considering the prior art reference in its entirety. Furthermore, Clegg's general statement provides no teaching or suggestion that would lead one

of ordinary skill in the art to modify the control system of Hohmann, Jr. as suggested by the Examiner. By asserting Clegg teaches the above noted missing claim limitations of claims 1 and 2, the examiner is applying an improper "obvious to try" argument in support of the obviousness rejection. See MPEP 2145(X)(B) "One cannot base obviousness upon what a person skilled in the art might try or might find obvious but rather must consider what the prior art would have led a person skilled in the art to do." *In re Tomlinson*, 150 USPQ 623 (CCPA 1966). An improper 'obvious to try' rationale is being applied when one skilled in the art would have "to vary all parameters or try each of numerous possible choices until one possibly arrived at a successful result, where the prior art gave either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful". See MPEP 2145(X)(B).

In regards to the control of the leveling implement, Clegg clearly discloses that "[t]he cross slope of the cut is determined by data input into the system from engineering plans and is controlled by the servo controller 140 which controls both elevation and cross slope angle through a pair of hydraulic rams 34a and 34b, the actual cross slope angle at which the grading blade is cutting being measured by a[sic.] cross-slope detector 35, the output of which is encoded in digital form in encoder 35a, or simply reported in digital form, or the digital comparator computer or central processing unit for the system shown at 120." Col. 11, lines 55-65. Accordingly, the cross-slope detector provides feedback to the processor that the actual cross-slope is substantially equal to the cross-slope data that was inputted into the system. Clegg, however, <u>is silent</u> on using a gravity base sensor or any alternative sensor to control the height of the ends of the blade upon losing reception by one of the laser receivers. For that reason, one skilled in the art is provided with no guidance as to how a loss of the laser reference by one of

the laser received is handled. Accordingly, Clegg fails cure the above noted deficiencies in Hohmann, Jr. regarding the above noted missing limitations of claims 1 and 2.

Burgin is cited for teaching gravity-based cross-slope sensors. Burgin is silent on using an alternative sensor upon losing reception by one of the laser receivers. Accordingly, although the above teachings of Hohmann, Jr. disclose the use of a pair of laser receivers, Clegg a slope sensor for positioning a tool during normal use, and Burgin a particular type of cross slope sensor, there is absolutely no teaching or suggestion in the cited art that the slope sensor may be used as an alternative sensor upon losing reception by one of the laser receivers, such as in a column block situation, to maintain the position of the tool.

Even if the references were combined, the resulting combination would be the screed of Hohmann, Jr. with the integrated grading system of Clegg having either the gravity-based cross-slope sensors of Burgin or the pendulum type cross-slope sensor of Heiser et al., which handles a column block situation as disclosed by Hohmann, Jr by using the signal from the unblocked detector until the column block situation clears. This is not the recited invention of claims 1 and 2.

As none of the above cited reference, individually or in combination, teach or suggest all of the claim limitations as pointed out above, the Examiner has failed to establish a *prima facie* case of obviousness. Accordingly, the rejection of claims 1 and 2 is improper and should be withdrawn.

D. Rejection of claims 3-5, 7-11 and 13-17 based on Hohmann, Jr. in view of Clegg fails to a establish *prima facie* case of obviousness and should be withdrawn.

As pointed out above, Hohmann, Jr. teaches the use of only one of the elevation detectors to control the position of the ends of the tool during a column block situation. Clearly, Hohmann, Jr. fails to disclose or suggest either the use of a pair of elevation receivers and a sensor for sensing slope of a screed head, or "a control circuit, responsive to the elevation receivers and to the sensor, for controlling the hydraulically movable ends of the screed head using the third signal from the sensor and one of the first and signal signals from the elevation receivers when the other of the first and second signals is not available" as recited by independent claim 3. Hohmann, Jr. also does not disclose or suggest a control circuit that maintains the screed head in an orientation such that the third signal remains substantially constant when one of the first and second signals from the elevation receivers is not available, whereby the orientation of the screed head along its length from the first end to the second end also is maintained substantially constant as recited by claim 4, which depends from claim 3. Hohmann, Jr. also does not disclose or suggest an inclinometer mounted on the screed head as recited by claim 5, which depends from claim 3. Hohmann, Jr. fails to disclose or suggest either the use of a pair of elevation receivers and a sensor for sensing slope of a screed head, or "a control circuit, responsive to the elevation receivers and to the sensor, for controlling the hydraulically movable ends of the screed head using the third signal from the sensor and one of the first and signal signals from the elevation receivers when the other of the first and second signals is not available" as recited by independent claim 9. Hohmann, Jr. also does not disclose or suggest an inclinometer mounted on the tool as recited by claim 10, which depends from claim 9. Hohmann, Jr. also does not disclose or suggest that the control circuit maintains the tool

in an orientation such that the third signal remains substantially constant when one of the first and second signals from the elevation receivers is not available, whereby the slope of the tool along its length from the first end to the second end also is maintained substantially constant as recited by claim 11, which depends from claim 9. Hohmann, Jr. also does not disclose or suggest "sensing slope of the tool along it length" and "controlling the elevational positions of the ends of the tool using the sensed position of one of the ends of the tool and the sensed orientation of the tool along its length from one end to the other when such positions are not both know" as recited by independent claim 13. Hohmann, Jr. also does not disclose or suggest detecting lateral movement of the tool generally in the direction of the length of the tool, and discontinuing controlling the elevational positions of the ends of the tool using the sensed orientation of the tool until the lateral movement of the tool generally in the direction of the length of the tool is terminated as recited by claim 14, which depends from claim 13. Hohmann, Jr. also does not disclose or suggest sensing slope of the tool along its length includes using an inclinometer as recited by claim 15, which depends from claim 13.

The fact that Hohmann, Jr. also does not disclose maintaining the screed head in an orientation approximately parallel with a desired transverse slope as noted by the Examiner, only further proves that the above noted limitations of the claims are missing from the teachings of Hohmann, Jr.

As mentioned above in the previous section, Clegg <u>is silent</u> on using a gravity base sensor or any alternative sensor to control the height of the ends of the blade upon losing reception by one of the laser receivers. For that reason, one skilled in the art is provided with no guidance as to how a loss of the laser reference by one of the laser received is handled. Accordingly, Clegg

fails cure the above noted deficiencies in Hohmann, Jr. regarding the above noted missing limitations of claims 3, 4, 5, 9,10, 11, 13, 14, and 15.

Accordingly, even if the references were combined, the resulting combination would be the screed of Hohmann, Jr. with the integrated grading system of Clegg, which handles a column block situation as disclosed by Hohmann, Jr. by using the signal from the unblocked detector until the column block situation clears. This is not the recited invention of claims 3, 4, 5, 9,10, 11, 13, 14, and 15.

As none of the above cited reference, individually or in combination, teach or suggest all of the claim limitations as pointed out above, the Examiner has failed to establish a *prima facie* case of obviousness. Accordingly, the rejection of claims 3-5, 7-11 and 13-17 is improper and should be withdrawn.

E. <u>Rejection of claims 6 and 12 based on Hohmann, Jr. in view of Clegg and Heiser et al. fails to a establish *prima facie* case of obviousness and should be withdrawn.</u>

As pointed out above, Hohmann, Jr. teaches the use of only one of the elevation detectors to control the position of the ends of the tool during a column block situation. Clearly, Hohmann, Jr. fails to disclose or suggest either the use of a pair of elevation receivers and a sensor for sensing slope of a screed head, or "a control circuit, responsive to the elevation receivers and to the sensor, for controlling the hydraulically movable ends of the screed head using the third signal from the sensor and one of the first and signal signals from the elevation receivers when the other of the first and second signals is not available" as recited by independent claim 3. Hohmann, Jr. also does not disclose or suggest an inclinometer mounted on the screed head as recited by claim 5, which depends from claim 3. Claim 6 depends from

claim 5, and recites that the inclinometer is a pendulum sensor with a low pass filtered output. Hohmann, Jr. clearly does not disclose or suggest the above limitations of claims 3, 5, and 6. Hohmann, Jr. fails to disclose or suggest either the use of a pair of elevation receivers and a sensor for sensing slope of a screed head, or "a control circuit, responsive to the elevation receivers and to the sensor, for controlling the hydraulically movable ends of the screed head using the third signal from the sensor and one of the first and signal signals from the elevation receivers when the other of the first and second signals is not available" as recited by independent claim 9. Hohmann, Jr. also does not disclose or suggest that the sensor recited in claim 9 is a pendulum sensor with a low pass filtered output as required by claim 12.

As mentioned above in the previous section, Clegg is silent on using a gravity base sensor or any alternative sensor to control the height of the ends of the blade upon losing reception by one of the laser receivers. For that reason, one skilled in the art is provided with no guidance as to how a loss of the laser reference by one of the laser received is handled. Accordingly, Clegg fails cure the above noted deficiencies in Hohmann, Jr. regarding the above noted missing limitations of claims 6 and 12.

Burgin is cited for teaching gravity-based cross-slope sensors. Burgin also is silent on using an alternative sensor upon losing reception by one of the laser receivers. Heiser et al.is cited for teaching a pendulum type cross-slope sensor. Heise et al., likewise, is silent on using an alternative sensor upon losing reception by one of the laser receivers. Accordingly, although Hohmann, Jr. discloses the use of a pair of laser receivers, Clegg a slope sensor for positioning a tool during normal operation, and Burgin and Heiser et al, particular types of cross slope sensors, there is absolutely no teaching or suggestion in the cited art that the slope sensor may be used as an alternative sensor upon losing reception by one of the laser receivers, such as in a column

block situation, to maintain the position of the tool. Accordingly, the remaining cited references help to cure the above noted deficiency in the cited combination of the prior art.

In addition, the resulting combination of the cited art would be the screed of Hohmann, Jr. with the integrated grading system of Clegg having either the gravity-based cross-slope sensors of Burgin or the pendulum type cross-slope sensor of Heiser et al., which handles a column block situation as disclosed by Hohmann, Jr. This is not the recited invention of claims 6 and 12.

As none of the above cited reference, individually or in combination, teach or suggest all of the claim limitations as pointed out above, the Examiner has failed to establish a *prima facie* case of obviousness. Accordingly, the rejection of claims 6 and 12 is improper and should be withdrawn.

VIII. CONCLUSIONS

Claims 1-17 are nonobvious over and patentably distinguishable from the references cited by the Examiner. Accordingly, the rejections under 35 U.S.C. §103(a) should be reversed. Favorable action by the Board is respectfully requested.

Respectfully submitted,
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WAJ/

APPENDIX

1. (Original) A method for controlling movement of individual hydraulically moveable ends of a screed head carried by a machine so as to maintain a selected elevational position between each end of the screed head and an elevational reference in a concrete paving application, comprising: providing a control system controlling the hydraulically moveable ends of the screed head;

providing a pair of laser receivers and a gravity-based cross slope sensor to the screed head and in communication with the control system;

setting the pair of laser receivers in an appropriate dead band with the elevational reference; and

using the gravity-based cross slope sensor when one of the laser receivers loses reception of the elevational reference to provide a relative measurement of the interrupted laser receiver which, when coupled with an absolute measurement of the uninterrupted laser receiver, provides an estimate of the absolute position of the interrupted laser receive, the control system using the provided absolute and estimated absolute positions to control the elevation of the hydraulically moveable ends of the screed head.

2. (Original) The method of claim 1, further comprising:

measuring a desired grade with the gravity-based cross slope sensor; and

storing the desired grade in memory of the control system.

3. (Original) A control system for controlling movement of individual hydraulically moveable ends of a screed head carried by a boom of a machine so as to maintain a selected elevational position between each end of the screed head and a reference in a concrete paving application as the screed head is moved toward the machine, comprising:

an elevation receiver, mounted on a first end of the screed head, providing a first signal indicating the position of the first end of the screed head in relation to the reference;

an elevation receiver, mounted on a second end of the screed head, providing a second signal indicating the position of the second end of the screed head in relation to the reference;

a sensor, mounted on the screed head, for sensing slope of the screed head along its length from the first end to the second end and providing a third signal indicating said slope; and

a control circuit, responsive to the elevation receivers and to the sensor, for controlling the hydraulically moveable ends of the screed head using the first and second signals from the elevation receivers when the first and second signals are available, and for controlling the hydraulically movable ends of the screed head using the third signal from the sensor and one of the first and second signals from the elevation receivers when the other of the first and second signals is not available.

4. (Original) The control system according to claim 3 for controlling movement of individual hydraulically moveable ends of a screed head carried by a boom of a machine so as to maintain a selected elevational position between each end of the screed head and a reference in a concrete paving application as the screed head is moved toward the machine, in which the control circuit maintains the screed head in an orientation such that the third signal remains substantially constant when one of the first and second signals from the elevation receivers is not available,

whereby the orientation of the screed head along its length from the first end to the second end also is maintained substantially constant.

5. (Original) The control system according to claim 3 for controlling movement of individual hydraulically moveable ends of a screed head carried by a boom of a machine so as to maintain a selected elevational position between each end of the screed head and a reference in a concrete paving application as the screed head is moved toward the machine, in which the sensor is an inclinometer mounted on the screed head.

6. (Original) The control system according to claim 5 for controlling movement of individual hydraulically moveable ends of a screed head carried by a boom of a machine so as to maintain a selected elevational position between each end of the screed head and a reference in a concrete paving application as the screed head is moved toward the machine, in which the inclinometer is a pendulum sensor with a low pass filtered output.

7. (Original) The control system according to claim 3 for controlling movement of individual hydraulically moveable ends of a screed head carried by a boom of a machine so as to maintain a selected elevational position between each end of the screed head and a reference in a concrete paving application as the screed head is moved toward the machine, in which the receivers are light detectors, and in which the reference is established by a beam of light.

8. (Original) The control system according to claim 3 for controlling movement of individual hydraulically moveable ends of a screed head carried by a boom of a machine so as to maintain a selected elevational position between each end of the screed head and a reference in a concrete paving application as the screed head is moved toward the machine, in which the receivers are laser light detectors and in which the reference is established by a beam of laser light.

9. (Original) A control system for controlling movement of individual hydraulically moveable ends of an elongated tool so as to maintain a selected elevational position between each end of the tool and a reference, comprising:

an elevation receiver, mounted on a first end of the tool, providing a first signal indicating the position of the first end of the tool in relation to the reference;

an elevation receiver, mounted on a second end of the tool, providing a second signal indicating the position of the second end of the tool in relation to the reference;

a sensor, mounted on the tool, for sensing slope of the tool along its length from the first end to the second end and providing a third signal indicating said slope; and

a control circuit, responsive to the elevation receivers and to the sensor, for controlling the hydraulically moveable ends of the tool using the first and second signals from the elevation receivers when the first and second signals are available, and for controlling the hydraulically movable ends of the tool using the third signal from the sensor and one of the first and second signals from the elevation receivers when the other of the first and second signals is not available.

10. (Original) The control system for controlling movement of individual hydraulically moveable ends of an elongated tool so as to maintain a selected elevational position between each end of the tool and a reference according to claim 9, in which the sensor is an inclinometer mounted on the tool.

11. (Original) The control system for controlling movement of individual hydraulically moveable ends of an elongated tool so as to maintain a selected elevational position between each end of the tool and a reference according to claim 9, in which the control circuit maintains the tool in an orientation such that the third signal remains substantially constant when one of the first and second signals from the elevation receivers is not available, whereby the slope of the tool along its length from the first end to the second end also is maintained substantially constant.

12. (Original) The control system for controlling movement of individual hydraulically moveable ends of an elongated tool so as to maintain a selected elevational position between each end of the tool and a reference according to claim 9, in which the sensor is a pendulum sensor with a low pass filtered output.

13. (Original) A method of controlling the elevational position of hydraulically moveable ends of a tool in relation to a reference detected by elevation receivers attached to the ends of the tool, said method comprising:

(a) selecting a desired elevational position of the tool with respect to the reference;

(b) sensing with the elevation receivers the position of the ends of the tool in relation to the reference;

(c) sensing slope of the tool along its length from one end to the other; and

(d) controlling the elevational positions of the ends of the tool using the sensed positions of the ends of the tool in relation to the reference when such positions are both known, and when reception of at least one of the elevation receivers of the reference is interrupted, controlling the elevational positions of the ends of the tool using the sensed position of one of the ends of the tool and the sensed orientation of the tool along its length from one end to the other when such positions are not both known.

14. (Original) The method of controlling the elevational position of hydraulically moveable ends of a tool in relation to a reference detected by elevation receivers attached to the ends of the tool, when reception of one of the elevation receivers of the reference is interrupted, according to claim 13, further comprising the steps of:

(e) detecting lateral movement of the tool generally in the direction of the length of the tool; and

(f) discontinuing controlling the elevational positions of the ends of the tool using the sensed orientation of the tool until the lateral movement of the tool generally in the direction of the length of the tool is terminated.

15. (Original) The method of controlling the elevational position of hydraulically moveable ends of a tool in relation to a reference detected by elevation receivers attached to the ends of the tool, when reception of one of the elevation receivers of the reference is interrupted, according to claim 13, in which the step of sensing slope of the tool along its length includes using an inclinometer.

16. (Original) The method of controlling the elevational position of hydraulically moveable ends of a tool in relation to a reference detected by elevation receivers attached to the ends of the tool, when reception of one of the elevation receivers of the reference is interrupted, according to claim 13, in which the elevation receivers are light detectors and in which the reference is a rotating beam of light.

17. (Original) The method of controlling the elevational position of hydraulically moveable ends of a tool in relation to a reference detected by elevation receivers attached to the ends of the tool, when reception of one of the elevation receivers of the reference is interrupted, according to claim 13, in which the elevation receivers are laser light detectors and in which the reference is a rotating beam of laser light.

EVIDENCE APPENDIX

NONE

RELATED PROCEEDINGS APPENDIX

NONE